Time Evolution of Epidemic Dynamics on Finite and Infinite Networks

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In the last decade, many real-world systems have been shown to display complex network structures [1,2,3]. The dynamics on such networks has attracted considerable attention: for instance, the propagation in human populations of infectious diseases or of rumours indicates how crucial a good dynamical understanding is. While numerical simulations offer great generality, they are generally difficult to interpret and one often relies on analytical approaches to provide the necessary insights. Existing formalisms [4,5,6,7] partly include the full complexity of the systems at hand: structure of the networks (realistic, finite-size), time evolution and characterization of outcomes (*e.g.* outbreak vs epidemics) to name a few. We have developed an analytical framework that improves over previous works in two complementary directions: **i. finite-size effects** have been identified and taken into account for discrete dynamics; and **ii. continuous time evolution** has been formulated for infinite networks. These are the first steps towards a formalism unifying continuous dynamics and finite-size networks. We will discuss the quantitative and qualitative differences with earlier studies and point out directions for further improvements.

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Acknowledgments:

CIHR grants and scholarship, Michael Smith Foundation for Health Research, BC Ministry of Health (PAN, BD, BP) and NSERC (LJD).

Abstract submitted to the:

"2008 CAP Congress"
June 8-11, 2008, Université Laval, Québec, Québec

Subject: Theoretical Physics – Statistical Physics (poster)